

Manufacturing Inclusion and Temper Resin Blocks for Ceramics Analysis and Training



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These blocks are intended to provide a simple reference tool for the identification of different tempers and inclusions in archaeological pottery. Here in the Ceramic Technology Lab, our blocks focus on common materials found in Florida pottery, but these can be customized for the needs of your geographic area.

Often the raw materials look different once they have been fired in the pottery, so we include both the raw material and samples of archaeological pottery in the blocks for comparison. By embedding these materials in epoxy, it is easy to compare pottery pastes under a microscope or hand lens. We use these for training in the lab and at outreach events.



Figure 1. Materials for preparing blocks. Clockwise from top left: liquid resin part A and B, resin mixing and measuring cups, silicone mold, bagged inclusions, sample sherd slices, toothpicks and stirrers, cardstock labels, tweezers, sample spoon, mold release agent.

A. Materials:

- Epoxy resin. There are many options for these two-part resins. I have had good results with the Naked Fusion brand.
- Molds. I use a silicone mold sold for cooking, with 6 rectangular wells that are 4.75" x 2.5".
- Mold release agent. There are many options for this. Budget option is very thin coating of petroleum jelly.
- Waxed paper or plastic cups for mixing the resin
- Disposable measuring cups for measuring the resin. I use 2oz/60cc medicine cups.
- Popsicle sticks or coffee stirrers
- Toothpicks
- Labels printed on cardstock, cut to fit molds
- Sample tempers/inclusions
- Sample sherds for each temper/inclusion type
- Sandpaper or emery board
- Tweezers
- Small sample spoon or funnel
- Paper towels
- Acetone
- disposable nitrile or latex gloves

B. PREPARING YOUR POTTERY SAMPLES

1. Obtain sherds containing common tempers and inclusions. Ideally, use unprovenienced and undecorated sherds that are not otherwise very useful. Lighter colored sherds work best, as the epoxy will make everything look wet, and therefore darker.
2. It takes only a small slice, approx. 1cm long X 0.5cm wide X 0.25cm thick to provide a good representative sample, so many slices can be made from a single sherd, with a portion kept back as a voucher, if desired.
3. Following manufacturers' instructions, use a rock saw or tile saw to remove cross-section slices of each sherd. Ensure you are creating slices that will showcase the inclusions in the best orientation. For some materials, such as sponge spicule pastes, the orientation should be parallel to the rim in order to view the spicules lengthwise.

If you do not have access to a mechanical saw as described above, you still have several options:

- a) Make slices with a hacksaw or coping saw fitted with a fine blade.
 - b) Use tile nippers to remove a fragment from the sherd. If the surface is relatively smooth, it may be used as is. Otherwise, grind the surface of the fragment with a barrel-shaped tungsten carbide or silicon carbide bit on a Dremel tool until desired surface is achieved.
4. Rinse prepared samples thoroughly and allow to dry.

C. PREPARING YOUR INCLUSIONS

The relevant inclusions will vary by the pottery assemblages under investigation. You need less than ¼ teaspoon of each inclusion per block. Instructions for common Florida inclusions:

1. Fiber/Spanish Moss: Collect and dry thoroughly to remove water. An oven may be used. Break and twist into small sections.
2. Sand/Grit: Collect or purchase quartz sand of different sizes. Rinse to remove potential coatings that would cloud the resin. You may wish to sieve sample to appropriate size classes (grit = coarse sand, >2.0 mm).

3. **Sponge Spicules:** Freshwater sponges are difficult to find and their conservation status is unknown. Instead of real sponge spicules, we use crushed quartz wool, which is equivalent in general size and shape to sponge spicules found in pottery. NOTE: this is a known carcinogen and a particulate respirator must be worn. Keep in closed container.
4. **Shell:** Obtain appropriate shell for your region and calcine it via burning in a campfire or grill. It will turn white and powdery when it is calcined, at which point it can be crushed easily with a stone or hammer. Sieve out the dust.
5. **Limestone:** Obtain a limestone rock and crush it with a hammer until you have fragments of appropriate size, typically medium to coarse sand (>0.43mm). Depending on the tradition in your research area, you may wish to calcine the limestone, as described for shell above. Sieve out the dust.
6. **Grog:** Using small nubbins of unprovenienced specimens or otherwise expendable pottery, crush to medium/coarse sand sized granules (>0.43mm).

D. FILLING YOUR MOLDS

1. Prepare your molds with a mold release agent. Follow package instructions. In general, you want a very even and thin layer of release agent. Rub off any visible streaks or residue, paying special attention to corners.
2. Lay out all of your materials. Ensure that your labels are pre-cut to fit within your molds, and place your sherd slices and inclusions in the order that matches the labels. Your surface must be flat, as epoxy is self-leveling. Put on gloves.
3. Prepare your resin, following package instructions. Many of the popular resins have a simple 1:1 ratio of resin to fixative. It is very important that you are precise in measuring out quantities of each, otherwise your resin may not set.

For each 4.25 x 2 x 0.25 inch block, you will need approximately 1.5 oz of prepared resin.

Working times vary, but you generally have less than an hour to manipulate the resin. For this reason, it is best to make blocks in small batches. I make 3 oz of resin at a time, which is enough to complete two blocks.

4. After thoroughly mixing resin according to package instructions, pour a few mm of resin into each mold. Smooth evenly into bottom of mold.
5. The base of the mold will be the top surface of your block, so as you place samples, ensure that the best face is downward, labels are downward, etc. Use tweezers to place your sherd slices. Use a small sample spoon or funnel to precisely place your inclusions. Powdery inclusions such as sand are subject to static electricity, so hold your finger or another object over the tip of the spoon until you are in the desired position.

At this stage, you can move materials around with a toothpick. Before placing the main label, use one to eyeball that sherds and inclusions will line up with the labels.

6. Once all of your sherds and inclusions have been placed, gently pour epoxy into the mold until everything is completely submerged. Place your label face down in between the columns of sherds and inclusion. Then gently pour the remaining epoxy into the molds and smooth over label surface.



Figure 2. Completed resin block, ready to cure in mold. Note everything is oriented so bottom surface will become the face.

7. As the resin sits, bubbles will begin to well up to the surface from air trapped by initial mixing or within the suspended materials. To create a more transparent product you can pop these bubbles or draw them out with a toothpick until the resin becomes tacky.

You may also wish to nudge labels at this time, as they tend to curl slightly.

8. Any spills or resin smudges can be cleaned with acetone on a paper towel or rag. Follow all safety precautions when working with acetone, and use with ventilation.
9. Once resin can no longer be modified, cover the mold with a piece of cardboard or similar rigid material and allow to set.
10. Following package instructions, but after at least 24 hours, you can gently push the blocks out of the mold. Most resins set within 24 hours, but take several days to fully cure.
11. After curing, sand the back edges, which tend to draw up the sides of mold a little. An emery board works very well for this purpose. You can sand the whole block if needed, but this is very time consuming and should be avoided if possible.

Your blocks are now ready to use!